LETTERS TO THE EDITOR.

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Snow-drifts on Ingleborough in July.

ON July 4 last I was on Ingleborough with a party of geologists examining the swallow-holes which mark where the water, running off the impervious drift and shale above Newby Moss on the southern shoulder of the hill, first reaches the Mountain Limestone. Some of these swallow-holes are what we may call obsolete—that is to say, when new openings have been formed and enlarged as time went on, some of the chasms which obviously at one time carried off the flood-water from a large gathering-ground, now receive only what oozes in from the peat and drift immediately round it, or the rain which falls directly on it: and rain seldom falls vertically up there. Some of them seem to have been developed without any large body of water having ever invaded them. They run to great depths, the open shaft being from 30 to 360 feet deep, below which the cavernous rock carries the water on through caves and crevices and open joints far down to the valley below.

In one of the vertical caves, which lies east of Long Kin and runs down into the limestone rock to a depth of some 70 feet, there were masses of snow to 4 feet in thickness. It was speckled brown on the surface, from the particles of peat which had been blown on to it, but was pure and white within. Obviously the chasm had been filled by drifted snow during the winter, and the summer's sun could not reach that depth to melt it, while the earth temperature was lost on the moist pinnacled rock on which it rested. No flood ever filled this particular chasm with a swirling torrent, such as at times fills Weathercote Cave, Hunt Pot, or even Gaping Ghyll up to the brim, and causes them to overflow.

Here, therefore, we had an accidental combination of conditions favourable for the preservation of snow, long past midsummer, at a height of not more than 1500 feet above the sea, on the flank of a Yorkshire mountain.

This is an interesting fact to bear in mind when speculating upon the causes of glacial conditions having so recently prevailed over the British Isles. We see here that half-way up Ingleborough, in an exceptionally hot summer, the air temperature alone could not remove last winter's snow.

T. MCKENNY HUGHES.

The Total Eclipse of the Sun of May 17-18, 1901.

IN the *Nautical Almanac Circular* (No. 18) local particulars of this eclipse are given for four places in the eastern portion of the shadow track, three of which, Padang, Pontianak and Amboyna, are situated in Netherlands India. In the explanations it is mentioned that, from inquiries which have been made, it appears that the positions selected are the most accessible, and that it would probably be impossible for observers to occupy any neighbouring station for which the astronomical conditions might be more favourable.

Surely these inquiries have not been made on the spot, where the information could best have been obtained. Other localities in the Government of Sumatra's west coast are as easily accessible as Padang, from which a railway leads to the interior; and other localities on the banks of the Kapuas as easily as Pontianak. Moreover, many other places may give opportunity to eclipse parties for observation, viz. on the islands of Lingga and Singkep, on the banks of the Barito and the eastern coast of Borneo, in the Gulf of Tomini (Celebes) and in the Moluccas. The conditions, however, will be most favourable in the western part of the Archipelago, both on account of the longer duration of totality and also for local resources. Through the Koninklijhe Natuurkundige Veruniging at Batavia, data have been gathered referring to the conditions of weather and cloudiness at a number of stations most suitable for the observation of the eclipse, and the data will be published in due time. The general impression is, however, that the chance for fine weather is nowhere very great. The Society will be pleased to procure full information as to the choice of stations, and observers may be sure to receive every available assistance from the local authorities and officials in the Dutch colonies.

J. J. A. MULLER.

(President of the Kon. Natuurk. Ver., Batavia, July 17).

The Reform of Mathematical Teaching.

MANY schoolmasters tell us that boy-nature is so depraved that his time must be fully occupied, and that a "regular hard grind" is the only way to keep him out of mischief. They give him things to grind that do not interest him; it may be that he does not understand them, or that they have no human interest. And yet every boy has interests, and teaching directed towards those interests would enthral him. The first aim should be to attract the boy's attention, and a subject which no excellence of teaching will make interesting to a particular boy is no fit subject of study for him.

The case of mathematics is bad. The reasoning is too abstract for a boy's mind, but it has worse faults. Long strings of reasoning are employed to deduce fairly obvious conclusions from premises no more obvious, *e.g.* in the theory of parallels. On the other hand, incorrect proofs are given because the boy cannot grasp correct proofs. *e.g.* for the binomial theorem. Geometry is in worse case than algebra. Euclid's interest was logical rather than geometrical; he wished rather to put together a consistent series of syllogisms than to give the best solution of his problems: witness his bisection of a straight line. In consequence, the natural order of development is lost sight of. A boy ought to be at home with ruler and compasses before he reasons about the constructions possible with them, and yet most schoolboys have never handled compasses. A few weeks ago I asked some hundred boys in a well-taught school (as present teaching goes) to give a certain construction of Euclid's, and also to carry out the construction with ruler and compasses on a given line. Hardly one failed to write out the construction and proof, but only one of the hundred carried out the practical construction. Clearly our present Euclidian teaching has little to do with geometry.

To lay before a boy a proof he does not understand is useless, to prove the obvious is confusing, to give an incorrect proof is immoral. Prof. Perry's plan to abolish proofs in the early stages is a great step in advance of present teaching. For the boy of mathematical ability it would perhaps be well to run theory alongside, at the rate of five or six propositions for Euclid's entire first book. This would, however, interfere with class teaching, and the mathematical boy would lose little by going through a good deal of the practical course before touching theory; if with a hint here and there he could be got to evolve the theory for himself, he would gain much.

Possibly a theoretical training leads one to look with too favourable an eye on early theory. In any case, that in the hands of a good teacher theory and practice could well go hand in hand for boys even of average ability is shown by two able papers by Mr. Branford, in the *Journal of Education*, on the first teaching of geometry. We may finally reach this stage, but till we have these good teachers practice should precede theory.

DAVID MAIR.

Functions of an Organ of the Larva of the Puss Moth.

THIS season I am breeding, with the object of observing their gradual growth and development, a number of the larvæ of *Cerura* (or *Dicranura*) *vinula*, the Puss Moth; but I have sought in vain for the function performed by the slender red filaments, ejected, at the insect's will, from its twin tails. They appear to shoot from their sheathes, just on the same principle as do a cat's claws; but to what purpose?

Surely such a beautiful, delicate organism could not have been appointed to no purpose! Is this merely an instance of entomic mimicry, simulating, for its own protection, the sting of some venomous insect; or does this strange organ perform some practical, active function?

I shall be very greatly obliged if you can tell me whether this point has been already decided or not, and, in the latter case, perhaps some of your correspondents will kindly communicate their views upon it. ARTHUR S. THORN.

4 Malcolm Road, Penge, August 10.

Dark Images of Photographed Lightning Discharges.

A VERY clear illustration of the reason why some of the lightning discharges in a photographed thunderstorm appear dark was afforded me at Wednesfield, Staffordshire, about mid-day on Thursday, July 19. There were a number of double flashes, that is, two discharges occurring rapidly in the same apparent

region, but following different courses, and separated in time by from one-eighth to one-half of a second. But one flash, quite near to where I stood (one second and a half between flash and sound), gave a repetition following absolutely the same path as the first flash and practically as bright. The only difference was that two faint branches of the first flash were not repeated in the second discharge. The second flash followed so quickly (about an eighth of a second, I estimate), that the impression on the retina of the first discharge had not died out when the second exactly covered it, so that I could appreciate the absolute coincidence. A few kinematographic records of thunderstorms would show whether or not such repetitions are common, and whether they are the cause of dark flashes on the photographic plate.

Cave Castle, Dumbartonshire, N.B. J. B. HANNAY.

THE LAVOISIER MONUMENT.

THE monument erected by international subscription in honour of Lavoisier was unveiled on July 27, in the presence of M. Leygues, French Minister of Public Instruction, and many eminent men of science, including most of the members of the International Congress of Chemistry. The committee entrusted with the raising of the fund for the statue succeeded in obtaining a sum of 100,000 francs, which was subscribed by admirers of Lavoisier in most parts of the civilised world. M. Moissan was the secretary of the committee, and he acknowledged at the unveiling ceremony that there had not been the slightest difficulty in obtaining the means to erect the monument—many subscribers, indeed, were astonished to learn that Paris, where monuments abound, did not possess a statue of the eminent chemist whose investigations helped to lay the foundations of modern chemistry. It is true that appreciation of the great chemist has been shown by the publication of his complete works, but these are only known to a limited number of students, and the people who live in the present are likely to forget how much they owe to the past unless they are reminded of their indebtedness by some striking monument in bronze or stone. For this reason, it is well that a permanent memorial of Lavoisier's greatness has now been erected.

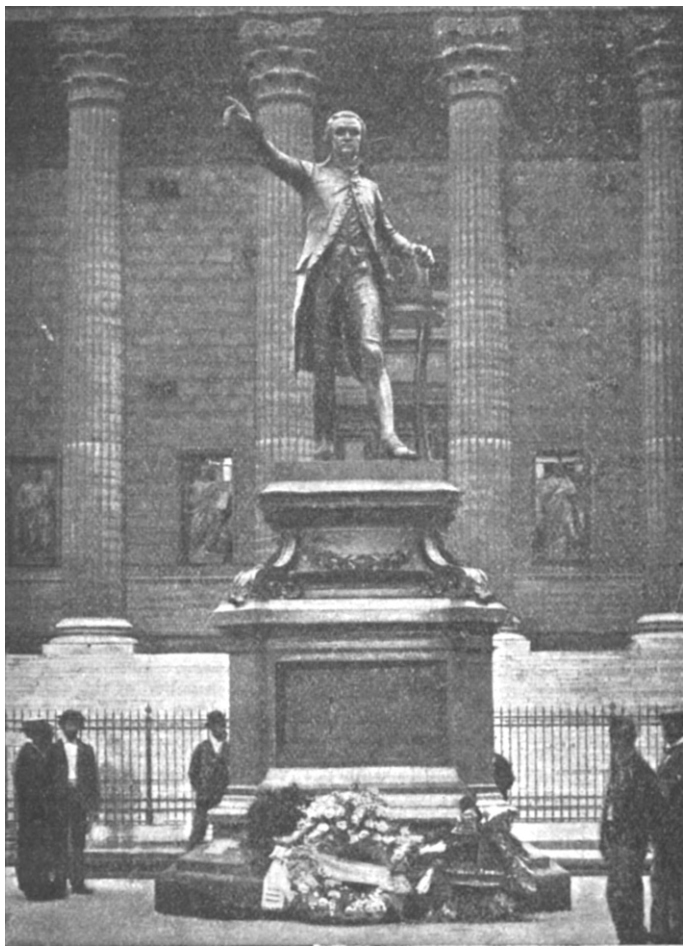

FIG. 1.—The statue of Lavoisier.

The statue, which is represented in the accompanying illustration from *La Nature*, is erected in the open space behind the Madeleine Church, close to the house where Lavoisier lived for some years. It is of bronze, and stands upon a granite pedestal ornamented with bas-reliefs. The statue is by M Barrais, and the pedestal is due to M. Gerhardt. Upon the front of the statue the following inscription appears, in French, "Antoine Laurent Lavoisier, 1743-1794, founder of modern chemistry. Erected by public subscription, under the patronage of the Academy of Sciences. M. Berthelot, Permanent Secretary of Physical Sciences, 1900." One of the bas-reliefs represents Lavoisier explaining his discovery of the composition of air to his colleagues of the Academy of Sciences, of which he was president, the characters introduced into the scene being Monge, Lagrange, Condorcet, Berthollet, Vicq d'Azyr, Laplace, Lamarc and Guyton de Morveau. On the other bas-relief Lavoisier is shown in his laboratory dictating notes to his wife. The statue appears to be a real work of art, worthy of the sculptor and of the subject.

M. Berthelot was to have presided at the ceremony of the unveiling, but illness prevented him from being present, and his address was read by M. Darboux.

Reference was made to the fact that the inauguration took place under the auspices of the Institute of France, the City of Paris and the French Government, and stress was laid upon the truly international character of the homage to the genius of Lavoisier, as testified by the subscriptions. The following is a free translation of parts of the address :—

> The names of Galileo, Newton, Leibnitz and Lavoisier show that science has no nationality, a monopoly of pure or applied science being the property of no one nation. The erection of a statue in a public place is an honour usually reserved for statesmen and warriors, men who have spattered the earth with blood, too often without lasting profit to the nation devoted to them. To-day the famous savant, thinker, artist, is put in the first rank by enlightened people, and posterity will doubtless continue to show an increasing respect for the memory of those men who have served the human race, and to relegate to obscurity the men of blood and intrigue who have enslaved it.

The work of Lavoisier is epoch-making from two points of view, from that of philosophy, because he established the fundamental law which governs the chemical transformations of matter, and from the practical point of view, because this law has become the base of innumerable industries founded on these transformations, and the origin of the rules of hygiene and therapeutics which follow from it. The fundamental discovery of Lavoisier was the distinction between matter and the imponderable agents, such as heat, light, electricity, which